

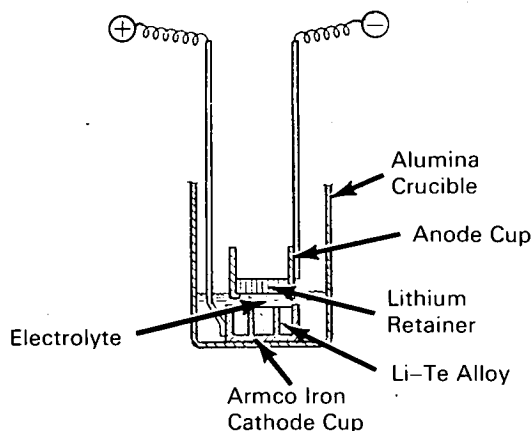


AEC-NASA TECH BRIEF



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Lithium-Tellurium Bimetallic Cell Has Increased Voltage



The problem:

To improve the power and current density of bimetallic cells with fused-salt electrolytes. Extensive research effort has been devoted to the development of high power and high energy density secondary cells, such as the lithium-chlorine, the sodium-sulfur, and the sodium-bismuth cells. Although the latter, a bimetallic cell with a fused-salt electrolyte, has demonstrated a high current density, both the power and current densities need to be improved before the bimetallic cell can be considered fully competitive.

The solution:

A lithium-tellurium secondary cell with a fused lithium halide electrolyte, tested in the temperature range 467° to 500°C, shows improvement over the sodium-bismuth cell. The voltage of this bimetallic cell was increased by using the more electropositive anode material, lithium, and the more electronegative cathode material, tellurium. Also, the equivalent weights of lithium and tellurium are much lower than those of sodium and bismuth, yielding a cell of higher energy density.

Current densities in excess of 12 amps/cm² were obtained on discharge, with maximum power densities of 5 W/cm² available at 5 to 7 amps/cm². Similarly high charging rates (less than 15 minutes for full recharge) were found, indicating that the lithium-tellurium cell may have applications in many areas, including those requiring very rapid recharge rates.

How it's done:

The experimental lithium-tellurium cell was constructed as shown in the figure. The cathode cup was 3.7 cm ID by 2.2 cm high, corresponding to an active cathode area of 10 cm². An annular fin in the cathode cup aided in current collection. Armco iron was used for the cathode cup and type 316 stainless steel was used for the anode metal retainer-current collectors.

The amounts of lithium and tellurium in the cell were varied; the maximum ratio of lithium to tellurium corresponded to 30 at/o Li in Te in the cathode alloy at complete discharge. The maximum capacity of the cell was 9.55 amp-hr, and the melting point of tellurium, 449.80°C, determined the

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minimum cell operating temperature. All experiments were performed in a high-purity helium atmosphere.

After test periods of up to 300 hours at temperatures of 450° to 500°C, no degradation of the electrolyte was observed. Armco iron proved suitable for short-term use with tellurium and lithium, and 0-series stainless steels were resistant to lithium attack. For longer periods of time, some refractory metals and their alloys are stable toward liquid tellurium.

Note:

Inquiries concerning this innovation may be directed to:

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Reference: B68-10400

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Patent status:

Inquiries about obtaining rights for commercial use of this innovation may be made to:

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